EXHIBIT A

MOTOROLA CONFIDENTIAL PROPRIETARY (upon completion)

MOTOROLA

Disclosure for Patent Committee Review
Submitted Pursuant to Employee Agreement

DISCLOSURE TYPE:

FOR TAH Department Use ONLY	
Disclosure Number **CAS 005**	Date
Division (s):	
Patent Committee Action:	

SHORT FORM ☐   *When using the short form (single page), the review committee may request additional information before reaching a decision.*

EXPANDED ☒   *Use additional pages in the expanded form if you feel more information will be necessary for the committee to reach a decision.*

1. Title of Invention: Method for multi-level, distributed speech recognition.   1a. Key Words: Distributed, speech recognition

2. Primary or contact point inventor(s) Use *your full first, middle and last names. Use page 2 of the expanded disclosure form for contributing inventors.*

1) Senaka Balasuriya	*Signature*	UA926	IL99/600	6308383221
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Sri Lanka				
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2) Jayanthi Rangarajan	*Signature*	UA926	IL99/600	6303054542
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3)				
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3. What was the problem(s) to be solved by the invention or what was the need(s) for the invention:
Speech recognition in handheld devices is very limited because of processing and information storage limitations (i.e. the PIM on a phone is small). On the other hand, centralized, network-based servers can recognize a much larger vocabulary (i.e. a large PIM, dynamic real-time information) but this is slow because of network constraints and higher processing needs. The invention enables fast, cost-effective, and comprehensive speech recognition through a multi-level, distributed approach.

4. What is the prior art, and why doesn't it resolve the problem(s) or fulfill the need(s):
Speech recognition on a centralized server or on a device is well known in the art. However, multi-level speech recognition involving recognition first, on a device and then on a server is considered to be new. — via D-T or
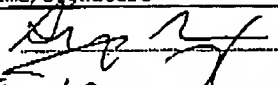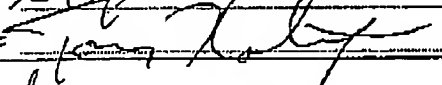
5. **What is the invention being disclosed:**

This invention provides a method for multi-level, distributed speech recognition, where the device performs speech recognition first and if unable to do so successfully or completely, refers speech recognition to a remote server. This way, the client device can perform recognition whenever it can and the remote server is utilized only when necessary.
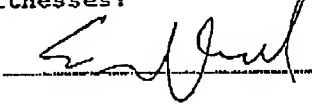
6. **How does this invention resolve the problem(s) and fulfill the need(s) in a new way:** *Attach any drawings or diagrams you feel are necessary for clarification.*

This invention enables speech recognition to be performed at multiple levels and enables a flexible, quick, cost-efficient system for performing recognition on a device, a remote server, or on a combination of those. It also enables a device (i.e. phone) to access different services based on recognition (i.e. weather vs. nearest restaurant).

7. Date of conception ▮▮▮▮ and if applicable, date first built (or written) and successfully tested: Not Yet

8. Product(s) this invention may be used in: Systems that use speech recognition such as phone devices and servers such as MIX/Myosphere.

9. Date the first offer for sale was made for a product _incorporating_ this invention: N/A

10. Date the first disclosure of this invention was made outside Motorola without a nondisclosure agreement: N/A

11. **Approvals:** 1) Technical Staff or _Patent Liaison_ 2) _Management_ (both required) *Signing this form attests to the fact that you understand the invention.*

	Name/Signature	Dept. No.	Location/Rm. #	Phone Number
1)	Greg Johnson	UA003	IL 9T	63-353-▮▮▮▮
2)	Tony Kobrinetz			

12. Witnesses:

Witnes s:		Date: ▮▮▮▮	Witnes s:		Date: ▮▮▮▮

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13.   Contributing Inventor(s):   *Patent Department will determine legal invente... ~*

4)

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5)

Name	Signature	Dept. No.	Location/Rm. #	Phone Number
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6)

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7)

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8)

Name	Signature	Dept. No.	Location/Rm. #	Phone Number
Citizenship	SSN	Street		City	State	ZIP

14.   What is the business impact of having a patent on this invention, for Motorola and/or competition:

This invention will help Motorola preserve and extend its advantage in speech enabled services by enabling fast, efficient, cost-effective speech recognition.

15.   Expanded description; list any additional details you feel would be helpful in describing the invention:

(See attached)

16.   Additional details concerning the prior art related to this invention:

Attach any backup documents or provide any other information you feel would be helpful in determining the desirability of obtaining a patent on this invention. Any attachments that are critical to the disclosure of the invention should be witnessed.

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Additional Information:

·This invention provides a method for multi-level, distributed speech recognition, where the device performs speech recognition first and if unable to do so successfully or completely, refers speech recognition to a remote server. This way the client device can perform recognition whenever it can and the remote server is utilized only when necessary.

The first aspect of the invention is to defer recognition to a server, in the event that the device cannot recognize the utterance (i.e. the grammar doesn't contain words in the utterance). An example would be when a user selects weather service on a phone (which is running on the device) and the user utters " Stockholm" , the phone's speech recognizer will try to recognize it. If it cannot recognize it because the phone's limited grammar does not contain " Stockholm" , the phone can forward the request to a remote server. This server will perform recognition on " Stockholm" and provide the recognized utterance back to the phone. Now, the phone's weather service can present the user with weather in Stockholm. (or the remote server can provide weather for Stockholm, instead)

The second aspect of the invention is the ability to defer recognition to a server, if the device does not have sufficient processing power (CPU) or power. For example, when the device is connected to a laptop or to a telematics system in a vehicle (which provides higher processing capability) and/or a power connection, the device can perform speech recognition to a better extent than before.
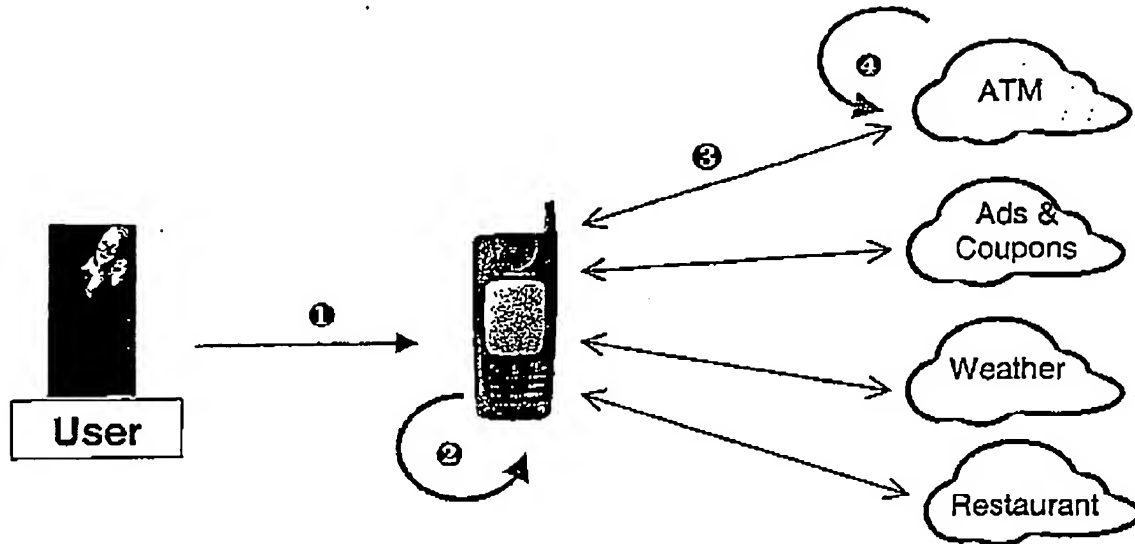
The third aspect of the invention is the ability to understand keywords and forward the utterance to an appropriate recognizer. For example, when a user utters " weather in Stockholm" , and the device recognizes " weather" (it's in the grammar) but not " Stockholm" (it's not in the grammar), it knows to forward the request to the appropriate server (i.e. weather, and not the nearest ATM service) along with any context information based on the recognized word.

Advantages/benefits:

1. The device can attempt to recognize an utterance, and if it cannot, it can forward the utterance to a more powerful, more feature-rich remote server for recognition. This makes the system more flexible.
2. Speech recognition can be done in parallel in local device (phone) as well as in remote server (MIX). This can improve recognition probability (two is better than one).
3. Local device can recognize parts of utterance and use that to direct to appropriate server. (i.e. local device recognizes " weather" in " weather at Stockholm" and uses that to direct the request to a remote server (European weather service).
4. If device doesn't have enough power and or CPU (i.e. laptop running on battery) to support full-featured recognition, it can forward the utterance to a remote server for recognition and other power intensive tasks. If device has sufficient power and CPU (i.e. laptop with power connection), it can perform full-featured recognition by itself.
5. Local device can recognize part of utterance and process that information, forward unrecognized parts to a remote server for processing, and combine processed information later for efficient service. This can potentially reduce cost (airtime, etc) and processing time.
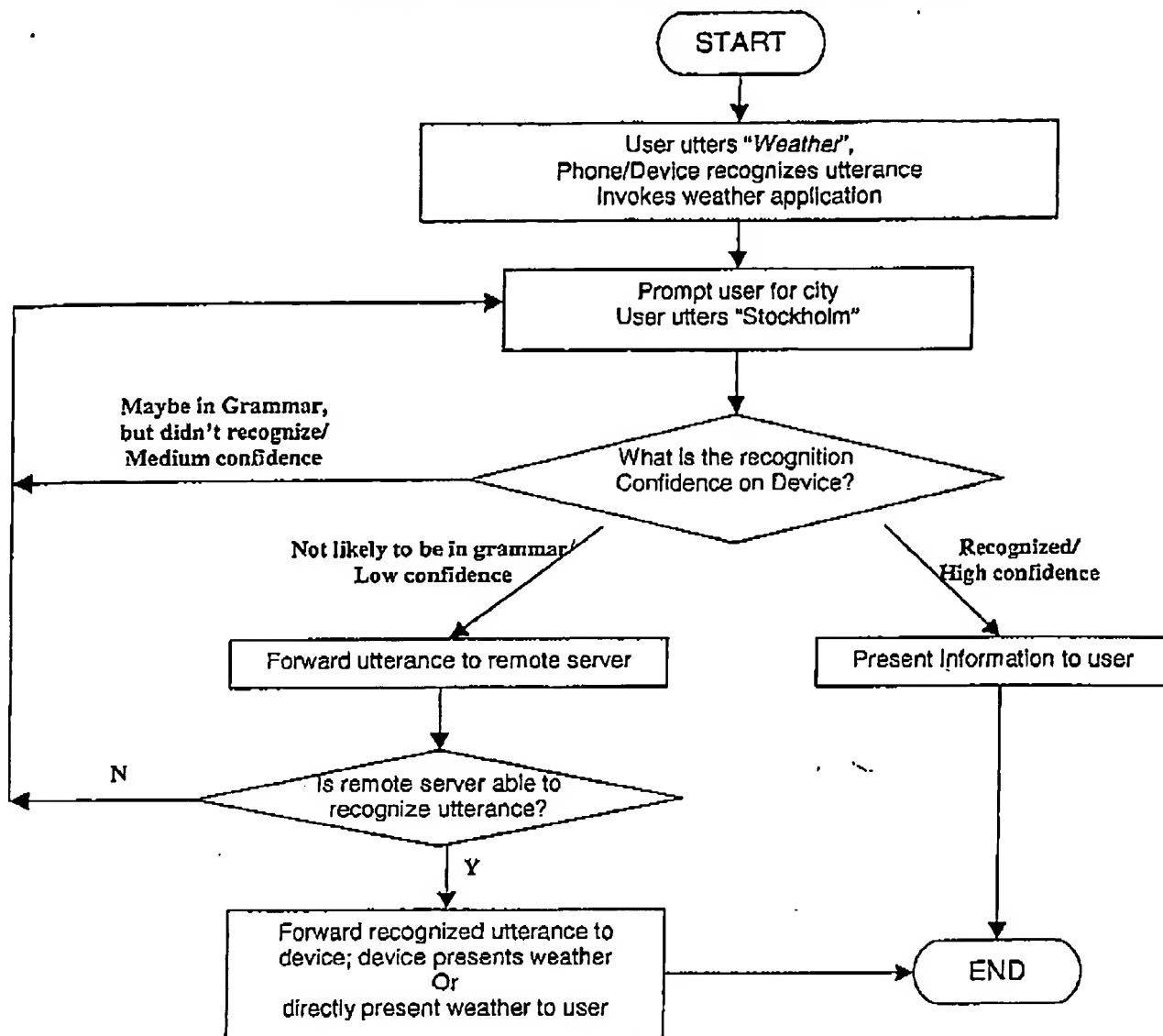
Example 1:

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❶ User calls MIX via voice and utters " Weather at Stockholm" to request the current weather conditions in Stockholm, Sweden.

❷ Phone/device performs speech recognition, recognizes sufficient information to identify service request (weather), but the grammar doesn't include Stockholm so it cannot recognize the latter part (" Stockholm").

❸ Device passes request to appropriate remote server (In this case, weather). This could be a separate server for weather only. Or it can be a common server but context relevant information is also passed on (in this case the context is that the user is looking for weather information), which can be used for such purposes as loading the correct grammar (the weather grammar consisting of city names instead of a grammar of store locations).

❹ Remote server performs speech recognition on request (" Weather at Stockholm") or the latter portion of the request (" Stockholm") and provides weather conditions in Stockholm, Sweden to the user.

❹ Alternatively, the remote server can pass back the recognized word to the weather service on the phone.

Example 2:

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                              ┌─────────────┐
                              │    START    │
                              └──────┬──────┘
                                     │
                                     ▼
                    ┌────────────────────────────────────┐
                    │      User utters "Weather",         │
                    │  Phone/Device recognizes utterance  │
                    │      Invokes weather application     │
                    └────────────────┬───────────────────┘
                                     │
                                     ▼
                    ┌────────────────────────────────────┐
      ──────────────►         Prompt user for city         │
                    │      User utters "Stockholm"         │
                    └────────────────┬───────────────────┘
                                     │
                                     ▼
Maybe in Grammar,            ╱─────────────────────╲
but didn't recognize/       ╱    What is the recognition   ╲
Medium confidence   ◄──────    Confidence on Device?        
                            ╲                           ╱
                             ╲─────────────────────────╱
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Maybe in Grammar,
but didn't recognize/
Medium confidence

Not likely to be in grammar/
Low confidence

Recognized/
High confidence

Forward utterance to remote server

Present information to user

N

Is remote server able to
recognize utterance?

Y

Forward recognized utterance to
device; device presents weather
Or
directly present weather to user

END